

# COP 6405: Analysis of Algorithms FINAL REVIEW - PART 2; Fall 2019

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1. By relaxing the edges of a weighted DAG (directed acyclic graph) according to a *topological sort* of its vertices, we can compute shortest paths from a single source in  $O(m+n)$  time, which is the time it takes to run topological sort in a DAG. Make sure you know how and why this works as explained in Section 24.2.
2. Solve 24.2-4 on page 658. It asks you to count the number of paths (not shortest paths) in a DAG.
3. Solve problem 24.3-2 on page 663, which asks for an example where Dijkstra's algorithm would fail when there are negative weight edges.
4. Solve problem 24.3-8 on page 664.
5. Solve problem 24.3-10 on page 664.
6. Explain the RELAX operation on an edge used in DIJKSTRA's algorithm. Explain why it is important to relax the edges of the graph in the right order.
7. Study algorithm TRANSITIVE CLOSURE on page 698 that modifies FLOYD-WARSHALL's algorithm to solve the *Transitive Closure* problem. Look at the difference between the two algorithms and describe the changes.
8. Solve problem 26.1-7 on page 714.
9. Write down precisely the statement of Menger's theorem connecting maximum flow to cuts.
10. Solve problem 26.2-6 on page 730.
11. Solve problem 26.2-11 on page 731.